API REVIEW

API's Review Shows EPA's Monitoring Wells at Pavillion, Wyoming are Improperly Constructed and Unsuitable for Groundwater Quality Assessment

Two new technical reports[1,2], were released by the United States Geological Survey (USGS) on September 26, 2012 regarding EPA's Pavillion, WY groundwater study and EPA's associated December, 2011 report[3]. These USGS reports describe the results of their April-May, 2012 testing of one of the monitoring wells (MW-01) previously sampled by EPA, and their attempts at sampling monitoring well MW-02, which was unsuccessful due to sampling issues related to well construction deficiencies.Counter to EPA findings,the USGS did findthe presence of several key chemical compounds of interest, most glycols and 2-butoxyethanol (2-BE), previously reported to be found in oring wells MW-01 and/or MW-02 b stituents previous ound EPA were found at significa ncentrati the USGS.

highlights sig antconcerns rega EPA's transp cy tigation an entifiessevere a merous moni construction fi This leave A's deep ng wells unsuita EPA's originally s objectiv color, and taste plaints in residential wells are gen shallower located nea e EPA monitoring wells. Du the num s deficiencies i design, c ruction, tallation, decontami on, and lopment (as desc elow ndwater sample a es from e wells (MW-01 and 02) are u able since it is no sible to de ine if chemicals found in the wells are due faulty well cons on or are pr t in local groundwater.

Specifi ave been identifiedinclude:

- USGS' SAP[2] specifieda criterion for sampling that required the pH of the groundwater to be stable for sampling. A review of the USGS data presented in their report[1] shows pH stabilization did not occur during sampling, and graphs in that USGS report suggest that well MW-01 is still being impacted by high pH cement (known to contain glycols and phenols) and/or drilling fluidsused by EPA. Review of all analytical and development data suggests that both monitoring wells MW-01 and MW-02 have yet to be properly developed and are both being affected by cement. USGS was unable to use standard USGS and best practice sampling/purging methods for monitoring well MW-02 due to completion and development problems encountered during the April-May, 2012 USGS investigation. In spite of USGS's valid concerns, EPA collected a sample of groundwater from MW-02 for analysis. Further, USGS appears to have revised their SAP[2] following completion of their April-May, 2012 sampling activities, which is highly unusual. It is recommended that all revisions of the USGS SAP be provided to the public.

- Another critical deficiencyin the construction of these wells is the fact that EPA failed to use a bentonite annular seal above the well screen and sand pack which ensures that cements used as annular sealants above this bentonite plug do not move down into the well screen and adjacent formation interval and affect groundwater quality results. The lack of this bentonite seal likely allowed cements to move down into the well screen and formation interval in both wells. EPA or state agencies typically do not accept results from monitoring wells lacking effective seals.

- USGS noted in their Sampling and Analysis Plan (SAP)[2], but not in their Data Series Report[1], that a 4-inch ***"threaded and coupled, black painted/ coated carbon steel casing"*** was used as riser pipe by the EPA in the construction of monitoring wells MW-01 and MW-02. Paint can contain a wide variety of organic and ounds, including 2-BE, a very common compon coatings. The well construction diagram ass ed de tions provided in the EPA 2011 Draft ccurately represen his 4-inch casing as stainless steel. rther, pictures provided in the 2011 Draft Report[3] show what appears to be a blue-painted san ut basket that fieldnotes suggest as welded to the top of the scree both wells, again bringing paint welding co ounds into contac h groundwater. This sand/grout ed with some type lack material, and the type a position of the black liner mate used should be disclosed. It i sound scientific practice to use pa d/coated casing or other cher containing materials in any envir ental monitoring well comp because compounds in the paint/coating or other materials can contam groundwater samples collected from the well. EPA recently leased ember 6, 2012) new well construction diagrams on their ion website for monitoring wells MW-01 and MW-02 that corrected numerous inaccuracies and misrepresentations presented in their 2011 Draft Report, but these new diagrams do not include or point out the use of black painted/coated casing or the painted sand basket.

- EPA did not disclose within its 2011 Draft Report[3] a landowner complaint related to an alleged release of anti-freeze (which contains glycols) and cement in the vicinity of monitoring well MW-01, and details regarding any associated cleanup activities. The driller's fieldnotes [4] from August 17, 2010 state: ***"Site cleanup and investigation on anitfreez [sic: antifreeze] and cement acuazations [sic: accusations] from property owner."*** EPA's fieldnotes and reporting of this incident are inadequate given the importance of quality assurance to this project. There appears to be EPA contractor and/or driller fieldnotes omissions surrounding the alleged release/cleanup dates (i.e. August 17, 19, and 21, 2010). All fieldnotes maintained by the drilling contractor and any of EPA onsite contractors should be disclosed and made publically available if they exist. EPA's field notes and reporting of this incident are inadequate given the importance of quality assurance on this project.

- Commercial rental air compressors appear to have been used for development of both wells by EPA. When monitoring groundwater for hydrocarbons, it is important that **hydrocarbon filters** be incorporated into the compressed air stream to ensure compressor hydraulic oils are not introduced into the groundwater being investigated. There is no mention of hydrocarbon filtersbeing utilized during the EPA Pavillion study. Lack of filterswould likely lead to false hydrocarbon related results. The compound 2-BE is also found in many cutting and hydraulic oils. EPA should disclose and provide documentation that hydrocarbon filterswere indeed used during drilling and well development.

- EPA's 2011 Draft Report discusses 7 of 10 additives used during drilling and installation of monitoring wells MW-01 and MW-02. Out of the 10 additives, organic analyses were only conducted on 3 additive products (but not the cements or lubricant). All materials and additives used down hole should have been analyzed by EPA to ensure the compounds were not incorrectly attributed to another source. For example, commercial grade cements used by EPA are widely known to contain glycols, particularly diethylene glycol, and possibly phenols. Key EPA laboratory analytical reports for 2-BE, diethylene glycol, and ethylene glycol for these additives appear to be missing from the EPA Pavillion website and should be provided for public review.

- EPA's 2011 Draft Report states *"There were no incidents of fuel spillage used to power pumps and generators."* Field notes collected by EPA's contractor suggest that there in fact was fuel loss at the site (MW-02 location) on July 14, 2010: *"diesel fuel lost from loose repaired."* The details surrounding this diesel fuel loss should be di nd further investigated.

- EPA's *"Final Mon Well Installation Plan, Pavillio yoming, 2010"*[5] outlined de amination procedu that were to b llowed by Work Plan a opriately required *well comple materi shall b ontamina by steam (pl -phosphorous if solids, o grease h rinsed prior to ins tion."* EPA contract fieldnote July 2 for MW-01 i te these decontaminati rocedur ere not follow *began de of riser for well. Stacke er on pl c and covered. te dec on pipes not perfor (pressu asher, soap). Pipe ca on ends. Road dust washe m pipes. visual signs of O/G.* The EPA driller's otes[7] reinforce t act: *"…wa 4" in well casing with garden se and cove th plastic."* EPA in its 2011 Draft Report appears to pr curate and misleading information regarding the use o contamination procedures for well construction equipment: *"Well Screens, sections of casing and tremie pipe were mounted above ground (never touched soil) and power washed (no detergents used) prior to deployment."* Milling and cutting oils on this type of casing are very common and may contain 2-BE and hydrocarbons, leading to sample contamination if not removed during decontamination procedures.

- USGS did not provide substantial technical interpretation of their April 2012 data, but rather was requested by a cooperative agreement with Wyoming[8] to provide those results to the panel tasked with looking at the broader EPA study.

- USGS[2] appropriately elected to not employ "swabbing" well development techniques across the screen interval in MW-02 due to potential induced contamination stemming from leaching of chemicals from the rubber swab stating that: *"Did not run block inside well screen as the screen's internal ribs would have cut the rubber block rendering it useless and leaving rubber material in the bottom of the well."* EPA apparently did not acknowledge those concerns and extensively swabbed the screen intervals in both wells, potentially cross contaminating the groundwater in both wells.

- Centralizers do not appear t extensively used (if at all) in the construction of th g wells. Centralizers position the riser pipe co in th orehol ensure uniform and even placement of grout between the ing and borehole wall. Poor annular seal can result in groundwater enter he well (or moving into other zones) at depths other than the screened in al.

CONC ICN

Based o information identified within this ment, as well as previously identified es [9], API has determined that the EPA monitoring wells drilled at Pavillion unsuitable to meet EPA's (or any g ndwater quality) monitoring ectives. A oundwater sample analyses from these wells should be dered u ble in the context of the information presented here prior to dev g cons ons or use in decision making. These wells are unsuitable for ass ment of groundwater quality and the results from analysis of any samples (past and future) from these wells are invalid and should never be used in technical evaluations. There is no scientific basis for continuing reviews and discussions of any such results and the EPA wells should be properly plugged and abandoned. The lack of sound scientific principles, practice, standards, and guidance for monitoring these well installations, as well as misrepresentations or omissions of information related to EPA's deep monitoring wells, raise significant questions, not only on this project, but EPA's ongoing efforts related to evaluation of hydraulic fracturing. API supports scientifically credible studies and will continue to evaluate the credibility of scientific assessments regarding onshore unconventional oil and gas exploration to ensure the information utilized in policy decision making is accurate.

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[1] "Groundwater-Quality and Quality-Control Data for Two Monitoring Wells near Pavillion, Wyoming, April and May, 2012", USGS Data Series Report 718, 2012.

[2] "Sampling and Analysis Plan for the Characterization of Groundwater Quality in Two Monitoring Wells near Pavillion, Wyoming", USGS Open-File Report 2012-1197.

[3] "Investigation of Ground Water Contamination near Pavillion, Wyoming", EPA 600R-00/000, December 2011

[4] ftp://ftp.epa.gov/r8/pavilliondocs/WellDrillingInformation/DrillingLogsAndCuttingsDescription/DailyLogsFromDrillersJunSep20 10.pdf

[5] Final Monitoring Well Installation Work Plan Pavillion Wyoming, USEPA, May 2010

[6] ftp://ftp.epa.gov/r8/pavilliondocs/WellDrillingInformation/DrillingLogsAndCuttingsDescription/FieldActivityLogD.pdf

[7] ftp://ftp.epa.gov/r8/pavilliondocs/WellDrillingInformation/DrillingLogsAndCuttingsDescription/DailyLogsFromDrillersJunSep20 10.pdf

[8] http://www.usgs.gov/newsroom/article.asp?ID=3410

[9] Review of U.S. EPA's December 2011 Draft Report, "Investigation of Groundwater Contamination near Pavillion, Wyoming, April 26, 2012, S.S. Papadopulos and Associates, Inc.